Remarks

Reconsideration of the subject application is requested in view of the following remarks.

Enclosed herewith are certified copies of the priority documents, JP 2000-346505 and JP 2001-336084.

The title is amended as requested in the Office action.

A set of formal drawings is enclosed herewith, which cures the objection to the drawings.

The search performed by the examiner in the course of substantively examining the claims is appreciated.

The allowance of claims 1-7 and the status of claim 9 as being free of the prior art of record are acknowledged with thanks.

Claims 1-14 are pending. In this paper, none of the pending claims is amended.

Claims 8, 10-12, and 14 stand rejected for alleged anticipation (35 U.S.C. §102(b)) by Ohtsuka. This rejection is traversed.

Independent claim 8 is directed to methods for measuring a surface profile of a test surface of an object. The method includes the following features:

(a) A phase distribution of interference fringes is measured with respect to the test surface.

(b) The interference fringes measured in (a) are produced by interference of a measurement light beam, reflected from the test surface, and a reference light beam having a prescribed wavefront profile.

(c) Also measured is a phase distribution of interference fringes, with respect to a prescribed verification standard, produced by interference of light reflected from the verification standard and the reference light beam.

(d) A profile difference is computed from the design-mandated data for the test surface.

(e) The profile difference includes a rotation-symmetry-error component and a rotation-asymmetry-error component.

(f) The rotation-symmetry-error component includes a high-order component of rotation-symmetry error and a low-order component of rotation-symmetry error.

(g) The high-order component of rotation-symmetry error is computed by extracting the high-order component from a difference between the phase distribution of interference fringes with respect to the verification standard and the phase distribution of interference fringes with respect to the test surface.

This combination of features in claim 8 is not taught or suggested by Ohtsuka.

The Office action refers specifically to FIG. 5 of Ohtsuka as allegedly disclosing the combination of features recited in claim 8. This contention is incorrect. First, it is pointed out that Ohtsuka is directed to measuring cylindrical shapes (see title of the patent; see also, for example, col. 1, lines 10-18; col. 3, lines 62-65; col. 4, lines 3-9 and 27-38). Rotational-symmetry errors as recited in features (e)-(g) of claim 8 are not applicable to cylindrical profiles (cylindrical lenses and mirrors) of the type that are measured by Ohtsuka. Hence, Ohtsuka does not teach or suggest items (e), (f), or (g) in any combination, and the contentions in the sentence on page 3 of the Office action, just above the reproduction of FIG. 5 of Ohtsuka, is incorrect.

Second, claim 8 requires not only that the interference fringes measured in item (a) be produced by interference of a measurement light beam, reflected from the test surface, and a reference light beam having a prescribed wavefront profile, but also that another phase distribution of interference fringes be measured be measured with respect to a prescribed verification standard, wherein these interference fringes are produced by interference of light reflected from the verification standard and the reference light beam. As stated in the instant specification on page 6, lines 7-12, for example:

> The verification standard 12 desirably is a reflective phase-zone plate that produces almost entirely low-order measurement errors even if a magnification error exists in its writing pattern. The verification standard 12 is used for verifying the accuracy of the reference standard 8. Specifically, the rotation-symmetry-error component (a high-order error component) of the reference standard 8 is verified with high accuracy using the verification standard 12.

FIG. 4(C) of Ohtsuka "shows the measurement system in which the object to be measured 206 . . . is disposed near the focusing line of the condenser lens 210 so as to allow the light to be co-called cat's eye reflected." This "cat's eye reflected" light inherently does not have rotational symmetry. Also, as described in Ohtsuka, "each of the measurement results obtained by the corresponding measuring systems 1, 2 and 3 [in

FIGS. 4(A), 4(B), and 4(C), respectively] is considered to be the difference between the wavefront errors in the measuring optical path and those in the reference optical path." It can be readily seen from this description that there is nothing in FIG. 4(C) or any other figure in Ohtsuka showing use of a verification standard, and there nothing in this description of FIG. 4(C) in Ohtsuka that would lead one to regard this figure as depicting anything concerning the claimed verification standard.

Hence, contrary to the contention in the Office action, any use in Ohtsuka of the test element (in the third position of FIG. 4(C)) as an alleged reference standard is not synonymous with the claimed use of a verification standard, does not suggest the claimed use of a verification standard, and provides no teaching or suggestion of any combination of features that would include any one or more of items (e), (f), and (g) in claim 8.

Third, items (e), (f), and (g) in claim 8 are similar to corresponding items in each of claims 1 and 7. With respect to item (e), it is pointed out that having a profile difference include a rotation-symmetry-error component and a rotation-asymmetry-error component in the manner claimed is distinctive. As described in the specification on page 8, lines 20-23, for example:

> The rotation-symmetry-error component is expressed as the sum of two components: a component that varies gradually with respect to the coordinates on the test surface 7a (referred to below as the "low-order component") and a remainder component (referred to below as the "high-order component").

The "profile difference" is discussed in the specification on page 10, lines 2-9, for example:

> The profile difference ΔW of the reference standard 8 relative to the verification standard 12 is computed, wherein $\Delta W = W_B - W_A$. A corresponding rotation-symmetry-error component (ΔW_r) is extracted by rotational averaging from the phase difference ΔW. "Fitting" of ΔW_r is performed using the $\delta(y)$ function noted above, allowing separation into corresponding second-order and fourth-order components (collectively low-order components) and remainder components (high-order components). The resulting high-order components of rotation-symmetry error are denoted ΔW_{rh}.

According to the foregoing, Ohtsuka provides no teaching or suggestion of treating rotationally symmetric errors as including a low-order component and a high-order component in this or in any other manner.

The foregoing discussion also is applicable to the obviousness rejection of claim 8 based on Ohtsuka.

Therefore, claim 8 and its dependents are neither anticipated by nor obvious from Ohtsuka, and are properly allowable over this reference.

In addition, each of the claims depending from claim 8 includes all the features recited in claim 8 as well as one or more additional respective features, and hence presents a respective combination of features that is distinguishable in its own right from Ohtsuka.

The foregoing discussion also is applicable in large part to claim 14, which requires, *inter alia*:

> computing a profile difference from the design-mandated data for the test surface, the profile difference including a rotation-symmetry-error component and a rotation-asymmetry-error component, the rotation-symmetry-error component including a high-order component of rotation-symmetry error and a low-order component of rotation-symmetry error, the high-order component being computed by extracting said high-order component from a difference between the phase distribution of interference fringes with respect to the verification standard and the phase distribution of interference fringes with respect to the test surface, and correcting the high-order component from the design-mandated data for the verification standard.

Therefore, all the pending claims are properly allowable over Ohtsuka, and early action to such end is requested.

Applicants have a right to an interview at this stage of prosecution. If any issues remain unresolved after consideration of the contents of this paper, the examiner is requested to contact the undersigned to schedule a telephonic interview. Any inaction by the examiner to make such contact, followed by issuance of a final action, will be regarded as an acquiescence by the examiner to grant an interview as a matter of right after the final action.

Respectfully submitted,

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